# PATENT ABSTRACTS OF JAPAN

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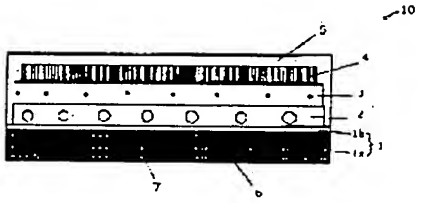
## (54) ELECTROLUMINESCENCE LAMP

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent drop in brightness even if the height of irregularities is sufficiently made high and surly prevent the occurrence of an interference fringe by forming a transparent layer of irregularities comprising resin and flake transparent fillers in the front of a light transmitting substrate.
SOLUTION: An EL layer is formed in the back of a light transmitting substrate such as a transparent film 1a, and a transparent layer of irregularities prepared by dispersing flake transparent fillers 7 in resin is formed in the front so as to have sufficient height of the irregularities. The flake fillers prevent the occurrence of an interference fringe without drop in brightness. Preferably, the recessed and projecting height of the transparent layer is made 10 μm or more, the ratio of the flake transparent fillers to the resin in the transparent layer is made 10-50 wt.%, and the thickness of the layer is made 13-40 μm, and the transparent layer is formed in the form of a pattern on the light transmitting substrate to constitute an electroluminescence lamp. Since the transparent layer has an effect on enhancement of brightness in the surface direction by the stacking shape of the transparent fillers, the thickness of the transparent layer can be made thick.

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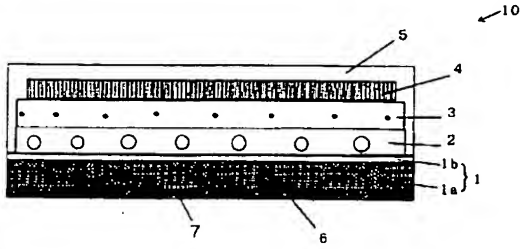
Drawing selection [Representative drawing]

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] It is cheap and especially this invention is the thing about a reliable electroluminescence LGT for which carried out suitable to the back light of liquid crystal, and generating of an interference fringe was prevented about the electroluminescence LGT.
[0002]
[Description of the Prior Art] Conventional electroluminescence LGT 30 has the structure which carried out laminating printing of a luminous layer 32, the reflective insulating layer 33, and the rear-face electrode 34 one by one on this transparent-electrode 31b of the transparent electric conduction film 31 in which transparent-electrode 31b was formed on bright film 31a, as shown in the important section expanded sectional view of drawing 8 . When using this electroluminescence LGT 30 as a back light of liquid crystal, generally an electroluminescence LGT is put on the background of liquid crystal (not shown), and it is fixing mechanically with the frame of a product etc. However, the interference fringe called Newton ring may occur, it may lap and be visible to a picture with the optical interference effect, and the display quality of liquid crystal may be spoiled remarkably.
[0003] Then, in order to solve the above-mentioned problem, the following electroluminescence LGTs are developed. As this kind of electroluminescence LGT 40 is indicated by JP,11-10774,A, and gets down and it is shown in the important section expanded sectional view of drawing 9 Structure which carried out laminating printing of a luminous layer 42, the reflective insulating layer 43, and the rear-face electrode 44 one by one is carried out on this transparent-electrode 41b of the transparent electric conduction film 41 in which transparent-electrode 41b was formed on bright film 41a. By having irregularity with a height of 0.1-10 micrometers in the front face of bright film 41a, and forming especially, the anti Newton ring layer 45 whose Hayes value is 0.5 - 20%, the crevice was prepared between liquid crystal and the electroluminescence LGT, and generating of an interference fringe is prevented.
[0004]
[Problem(s) to be Solved by the Invention] By the way, as a means to form irregularity in the front face of the aforementioned anti Newton ring layer, in case (1) resin is stiffened, there is the method of applying the resin which distributed particles, such as the method of pressing against a resin front face the mold which has the shape of desired toothing in a front face, (2) silicas, a melamine, and an acrylic, etc. The detailed irregularity formed in the mold tends to be buried with a resin, and the method of (1) has problems, like tending to change the size of the irregularity of an anti Newton ring layer, and precision, and a maintenance man day starts. Although the method of (2) can improve the trouble of the method of (1), it has another problem. For example, although the ink which distributed the spherical and massive acrylic bead etc. in the resin is applied and it is formed, since it is greatly dependent on selection of the diameter of a bead, preparation of application liquid, selection of the method of application, etc., control of concavo-convex size is difficult. If the diameter of a bead is large, the incidence efficiency of light will become bad, or transparency falls, and a brightness fall becomes large, and fine luminescence is no longer obtained. Conversely, although a brightness fall will be prevented if the diameter of a bead

becomes small, irregularity will become small and an interference fringe will occur. For this reason, with the above-mentioned conventional electroluminescence LGT, after suppressing a brightness fall, in order to prevent an interference fringe, concavo-convex height had to be restricted to 10 micrometers or less. However, this condition was not what it is hard-pressed to the variation in properties, such as concavo-convex height and a brightness fall, prevents a brightness fall, and can prevent an interference fringe certainly.

[0005] Then, this invention was made in view of the above-mentioned problem, and even if the purpose makes concavo-convex height sufficiently high, it is offering the new electroluminescence LGT which brightness's does not fall and can prevent generating of an interference fringe certainly.

[0006]

[Means for Solving the Problem] The electroluminescence LGT of this invention is characterized by forming in the front face of the aforementioned translucency substrate the transparent irregularity layer which consists of a resin and a scale-like transparent filler in the electroluminescence LGT in which the transparent electrode, the luminous layer, the reflective insulating layer, and the rear-face electrode were formed at the rear face of a translucency substrate. since there is an effect which suppresses a brightness fall even if it forms a transparent irregularity layer thickly that much, since it is effective in the transparent irregularity layer which consists of a scale-like transparent filler raising the brightness of the direction of a field with this composition, the irregularity which has sufficient height for the front-face side of an electroluminescence LGT can form, and the suitable electroluminescence LGT for the back light which is the liquid crystal which prevented generating of an interference fringe certainly can offer, without reducing brightness

[0007] Moreover, in the electroluminescence LGT in which the transparent electrode, the luminous layer, the reflective insulating layer, and the rear-face electrode were formed at the rear face of a translucency substrate, the transparent irregularity layer which consists of a resin and a scale-like transparent filler is formed in the front face of the aforementioned translucency substrate, and the electroluminescence LGT of this invention is characterized by the concavo-convex height of this transparent irregularity layer being 10 micrometers or more. Since the transparent irregularity layer of sufficient concavo-convex height can be formed by this composition, without reducing brightness, the electroluminescence LGT which can prevent generating of an interference fringe certainly can be offered.

[0008] Moreover, the rate of a scale-like transparent filler [ as opposed to / height / concavo-convex ] a resin in a transparent irregularity layer 10 micrometers or more / is characterized by being 10 - 50wt%. The suitable electroluminescence LGT for the back light of liquid crystal which can prevent generating of an interference fringe certainly can be offered without reducing the brightness which secured the adhesion of the transparent irregularity layer to a bright film, and was rich in practicality with this composition.

[0009] Moreover, the rate of a scale-like transparent filler [ as opposed to / height / concavo-convex ] a resin in a transparent irregularity layer 10 micrometers or more / is 10 - 50wt%, and it is characterized by the thickness of a concavo-convex layer being 13-40 micrometers. With this composition, in addition to the above-mentioned effect, it can form by application once using the screen of 250 to 150 meshes, and is effective in excelling in mass-production nature.

[0010] Moreover, it is characterized by carrying out pattern formation of the transparent irregularity layer on a translucency substrate. advantageous in brightness, since the permeability of the light of the agenesis field whose material efficiency can form the pattern formed in the shape of [ of the pattern formed with this composition in the shape of / of the pattern formed in the shape of a dot in a fixed interval and a configuration, a fixed interval, and width of face / a stripe, a fixed interval, and width of face ] a grid, and improves improves -- etc. -- there is an advantage

[0011]

[Embodiments of the Invention] It explains referring to drawing about the form of operation of the 1st of the electroluminescence LGT of this invention. Drawing 1 is the important section expanded sectional view showing the structure of electroluminescence LGT 10 of the form of the 1st

operation. The structural feature of this electroluminescence LGT 10 is that EL layer is formed in the rear face of translucency substrates, such as bright film 1a, and the transparent irregularity layer which made the front face (field in which EL layer is not formed) distribute the scale-like transparent filler 7 in a resin is formed in concavo-convex, height (for example, 10 micrometers or more) big enough. This scale-like transparent filler 7 prevents generating of an interference fringe, without reducing brightness. This electroluminescence LGT 10 can be manufactured as follows. First, on bright film 1a, on this transparent-electrode 1b of the transparent electric conduction film 1 which deposited transparent-electrode 1b, such as ITO, the ink which distributed in the resin the fluorescent substance (the fluorescent substance which carried out moisture-proof coating is also included) which activated zinc sulfide with copper is printed, and a luminous layer 2 is formed. Printing formation of the reflective insulating layer 3 which distributed white high dielectric powder, such as a barium titanate, in the resin on it is carried out. Printing formation of the rear-face electrode 4 which consists of electric conduction pastes, such as silver and carbon, on it is carried out. Next, printing formation of the overcoat layer 5 for an insulation is carried out. Especially, the transparent irregularity layer 6 is formed in ****** by screen-stencil etc. using the ink which made the front face of bright film 1a carry out specified quantity distribution of the transparent scale-like filler 7 into a resin. The formation sequence of the transparent irregularity layer 6 may be formed in bright film 1a before EL layer formation, and may be formed in bright film 1a after EL layer formation. In addition, the overcoat layers 5 are an insulation and an object for protection, and are unrelated to prevention of an interference fringe.

[0012] If the interior of the transparent irregularity layer 6 is expanded typically and shown, it will become as it is shown in the important section expanded sectional view of drawing 2 . In drawing 2 , a dashed line shows an EL element. Since the scale-like transparent filler 7 is a flat flake, if a resin is distributed and it is printed, its thing in the state where the flake lapped horizontally like drawing 2 will increase. It laps with a multilayer, moreover, since a fluidity is suppressed for the transparent scale-like filler 7, irregularity arises, and the transparent irregularity layer 6 has irregularity of an abbreviation trapezoidal shape, that the transparent scale-like filler 7 is level on the average and when number of layerses differ locally. Here, concavo-convex height is the distance from the nose of cam of heights to the bottom of a crevice, and is H of drawing 2 . In the transparent irregularity layer 6, since many flakes have lapped horizontally, if an EL element is turned on, incidence is carried out at right angles to a flake from a luminous layer, the light penetrated as it is will increase and loss of light will decrease. Furthermore, since the incident light from a luminous layer is refracted in a trapezoid portion and light is ahead condensed according to a kind of lens effect, vertical brightness becomes high at bright film 1a page. Therefore, since the thickness of **** by which a leeway is given in brightness, and the transparent irregularity layer 6 can be formed thickly and the layer of sufficient concavo-convex height (for example, 10 micrometers or more) can be formed, generating of an interference fringe can be prevented more certainly. Of course, even if it makes concavo-convex height smaller than 10 micrometers as usual, generating of an interference fringe can be prevented and there is a merit by which a leeway is conventionally given in brightness in this case. Moreover, since light is moderately scattered about by the concavo-convex layer, the nonuniformity of luminescence is lost and luminescence grace also improves.

[0013] Fine particles with the melamine several micrometers - 10 micrometers and whose thickness particle size is about 0.1-several micrometers, flat alkyd, polyester system, etc. carry out suitable [ of the transparent scale-like filler 7 used for the transparent irregularity layer 6 ], and a polyester system resin with sufficient adhesion etc. carries out suitable [ of the resin ] to bright film 1a. Depending on the particle size of the transparent scale-like filler 7, and thickness, a mixed rate with a resin, the thickness of the transparent irregularity layer 6, etc. are adjusted, and concavo-convex height can be optimized.

[0014] Now, although the prevention effect of an interference fringe was so large that concavo-convex height was high, the transparent irregularity layer had to be formed thickly and it was presupposed for brightness in the conventional knowledge that it was disadvantageous. However, according to this invention, a transparent irregularity layer can be formed thickly, without reducing

brightness. In the preliminary experiment, concavo-convex height found out comparatively the thing of the scale-like transparent filler to a resin intricately changed with the thickness of a transparent irregularity layer etc. In order to acquire desirable conditions, the trial production experiment was conducted and the result shown below was obtained.

[0015] Drawing 3 shows the relation between the rate of a scale-like transparent filler, and concavo-convex height to a resin. In addition, the thickness of a transparent irregularity layer was fixed and was set to 20**2 micrometers. Concavo-convex height is high and drawing 3 shows a bird clapper as the rate of a scale-like transparent filler becomes large. the rate of the scale-like transparent filler to a resin when the prevention effect of an interference fringe is so large that concavo-convex height is high, especially concavo-convex height is set to 10 micrometers or more and the thickness of the result of drawing 3 to a transparent irregularity layer is 20 micrometers, since an interference fringe can be prevented certainly -- more than 15wt% -- it is desirable for it to be alike and to carry out In addition, the interference fringe arranged the electroluminescence LGT in the bottom of liquid crystal, is in the state mechanically fixed by the frame, and evaluated it by viewing.

[0016] Drawing 4 shows the rate of a scale-like transparent filler and the relation of brightness to a resin. From drawing 4 , the rate of brightness of a scale-like transparent filler improves a little at 20 - 35wt%, and to about 50wt%, when it does not fall but 50wt% is exceeded, as for brightness, it turns out that it falls rapidly. Although not illustrated, the influence of the thickness of a transparent irregularity layer to brightness is small, and is considered to be the effect of a scale-like transparent filler. In order to prevent a brightness fall, you should make the rate of the scale-like transparent filler to a resin into less than [ 50wt% ]. In addition, brightness turned on and evaluated the electroluminescence LGT by AC power supply of 40V-600Hz. Moreover, when the rate of a scale-like transparent filler becomes large, there is an inclination for the adhesion to a bright film to fall, and less than [ 50wt% ] is desirable also from a viewpoint of adhesion.

[0017] Drawing 5 shows the relation between the thickness of a transparent irregularity layer at the time of making the rate of a scale-like transparent filler into a parameter, and concavo-convex height. The inclination it to be gradually saturated from drawing 5 if the thickness of a transparent irregularity layer exceeds 30 micrometers of abbreviation, although concavo-convex height becomes large rapidly with the increase in the thickness of a transparent irregularity layer to 30 micrometers of abbreviation is known. If the prevention effect of an interference fringe is so large that concavo-convex height is high and especially concavo-convex height is set to 10 micrometers or more, since an interference fringe can be prevented certainly From the result of drawing 5 , if the rate of a scale-like transparent filler is 10wt(s)%, for example Set thickness of a transparent irregularity layer to 40 micrometers or more, and if the rate of a scale-like transparent filler is 15wt (s)% Set thickness of a transparent irregularity layer to 20 micrometers or more, and if the rate of a scale-like transparent filler is 30wt(s)% An interference fringe can be certainly prevented by setting thickness of a transparent irregularity layer to 15 micrometers or more, and setting thickness of a transparent irregularity layer to 13 micrometers or more, if the rate of a scale-like transparent filler is 50wt(s)%. When the rate of a scale-like transparent filler is less than [ 10wt% ], in order to obtain a concavo-convex height of 10 micrometers or more, thickness of a transparent irregularity layer must be thickened, and the number of times of printing increases, and it becomes cost quantity, and is not desirable. Moreover, brightness also falls sharply.

[0018] Drawing 6 shows the thickness of a transparent irregularity layer, and the relation of brightness. From drawing 6 , to about 100 micrometers, if brightness is abbreviation regularity and 100 micrometers is exceeded, it will fall rapidly. Although not illustrated, the influence of the rate of the scale-like transparent filler to brightness is small, and is considered to be the effect of a scale-like transparent filler. In order to prevent a brightness fall from these results, the thickness of a transparent irregularity layer has desirable 100 micrometers or less.

[0019] It is desirable to consider as the conditions which can prevent an interference fringe certainly, without synthesizing and carrying out the brightness fall of the result shown in the above drawing 3 or drawing 6 , and to set to 10 micrometers or more the height of the irregularity of the transparent irregularity layer which consists of a resin and a scale-like transparent filler.

Furthermore, the range of 10 - 50wt% carries out suitable [ of the rate of the scale-like transparent filler to a resin ] as practical conditions which realized height with an irregularity of 10 micrometers or more, and took the adhesion to a bright film into consideration. The range of the thickness of a transparent irregularity layer is 13-100 micrometers, and it can be suitably chosen from drawing. However, since two coats will be needed in screen-stencil and productive efficiency will become bad if thin [ thick ], the thickness of 13-40 micrometers which can be formed once by application is the optimal practically using the screen of 250 to 150 meshes.

[0020] Next, it explains, referring to drawing about the gestalt of operation of the 2nd of the electroluminescence LGT of this invention. Electroluminescence LGT 20 of the gestalt of the 2nd operation is carrying out the same structure as electroluminescence LGT 10 of the gestalt of the 1st operation fundamentally shown in drawing 1 as shown in the important section expanded sectional view of drawing 7 . First, on the inside of bright film 11a, on this transparent-electrode 11b of the transparent electric conduction film which deposited transparent-electrode 11b, such as ITO, the process of electroluminescence LGT 20 prints the ink which distributed in the resin the fluorescent substance which activated zinc sulfide with copper, and forms a luminous layer 12. Printing formation of the reflective insulating layer 13 which distributed white high dielectric objects, such as a barium titanate, in the resin on it is carried out. Printing formation of the rear-face electrode 14 which consists of electric conduction pastes, such as silver and carbon, on it is carried out. Next, printing formation of the overcoat layer 15 for an insulation is carried out. Furthermore, it prints in the front face of bright film 11a in the shape of a pattern using the ink which distributed the transparent scale-like filler 7 (illustration ellipsis) in the resin, the transparent irregularity layer 16 is formed in it, and electroluminescence LGT 20 is obtained. The pattern formed in the shape of [ of the pattern formed in the shape of / of the pattern which is a pattern which can decrease in number uniformly, for example forms the printing area of the transparent irregularity layer 16 in the shape of a dot in a fixed interval and a configuration, a fixed interval, and width of face / a stripe, a fixed interval, and width of face ] a grid carries out suitable [ of the desirable pattern configuration ]. advantageous in brightness, since the permeability of the light of the agenesis field whose material efficiency improves improves with this pattern -- etc. -- there is an advantage Moreover, since the bright film is partially exposed, it is also easy to stick the protection film in which the adhesive layer was formed etc. and to paste up by the outcrop.

[0021]

[Effect of the Invention] The electroluminescence LGT of this invention is characterized by forming the transparent irregularity layer which consists of a transparent filler of the shape of a resin and a scale in the front face (field in which EL layer is not formed) of a translucency substrate. Since this transparent irregularity layer is effective in raising the brightness of the direction of a field with the laminating configuration of a transparent filler, it can form the part transparent irregularity layer thickly. Therefore, the irregularity which has sufficient height for the front-face side of an electroluminescence LGT can be formed, and the suitable cheap and quality electroluminescence LGT for the back light of liquid crystal which can prevent generating of an interference fringe certainly can be offered, without reducing brightness. moreover, advantageous [ in brightness ] by carrying out pattern formation of the transparent irregularity layer, since the permeability of the light of the agenesis field whose material efficiency improves improves in addition to the above-mentioned effect -- etc. -- it is effective

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## CLAIMS

[Claim(s)]

[Claim 1] The electroluminescence LGT characterized by forming in the front face of the aforementioned translucency substrate the transparent irregularity layer which consists of a resin and a scale-like transparent filler in the electroluminescence LGT in which the transparent electrode, the luminous layer, the reflective insulating layer, and the rear-face electrode were formed at the rear face of a translucency substrate.

[Claim 2] The electroluminescence LGT according to claim 1 characterized by the concavo-convex height of a transparent irregularity layer being 10 micrometers or more.

[Claim 3] A transparent irregularity layer is an electroluminescence LGT according to claim 2 characterized by the rate of the scale-like transparent filler to a resin being 10 - 50wt%.

[Claim 4] A transparent irregularity layer is an electroluminescence LGT according to claim 3 characterized by the thickness of a concavo-convex layer being 13-40 micrometers.

[Claim 5] The electroluminescence LGT according to claim 1 to 4 characterized by carrying out pattern formation of the aforementioned transparent irregularity layer on a translucency substrate.

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## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The important section expanded sectional view of the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 2] The important section expanded sectional view of the transparent irregularity layer formed in the bright film of the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 3] Drawing showing the relation between the rate of a scale-like transparent filler, and concavo-convex height to a resin with the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 4] Drawing showing the rate of a scale-like transparent filler and the relation of brightness to a resin to the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 5] Drawing showing the relation between the thickness of a transparent irregularity layer, and concavo-convex height with the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 6] Drawing showing the thickness of a transparent irregularity layer and the relation of brightness to the electroluminescence LGT of the gestalt of operation of the 1st of this invention
[Drawing 7] The important section expanded sectional view of the electroluminescence LGT of the gestalt of operation of the 2nd of this invention
[Drawing 8] The important section expanded sectional view of the conventional common electroluminescence LGT
[Drawing 9] The important section expanded sectional view of an electroluminescence LGT which has the conventional anti Newton ring layer
[Description of Notations]
1 11 Transparent electric conduction film
1a, 11a Bright film
1b, 11b Transparent electrode
2 12 Luminous layer
3 13 Reflective insulating layer
4 14 Rear-face electrode
5 15 Overcoat layer
6 16 Transparent irregularity layer
7 Scale-like Transparent Filler
10 20 Electroluminescence LGT

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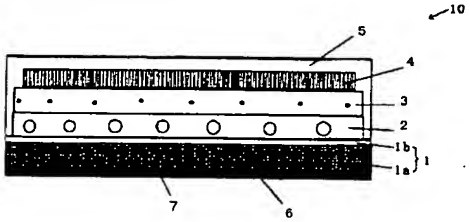
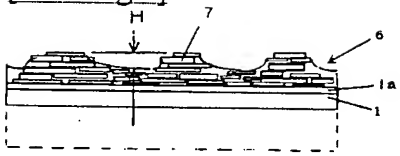
## DRAWINGS

[Drawing 1]




[Drawing 2]

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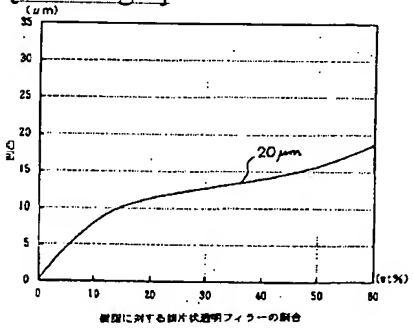
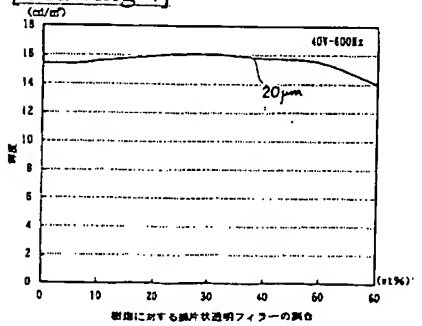



[Drawing 4]

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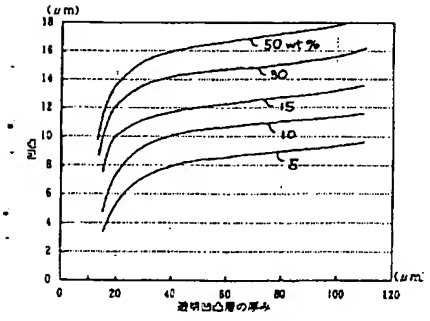


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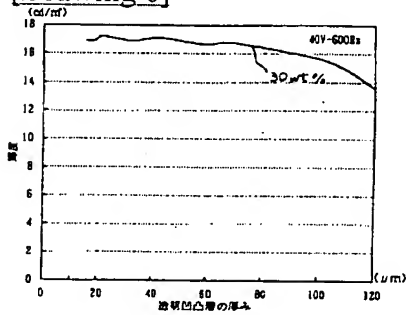


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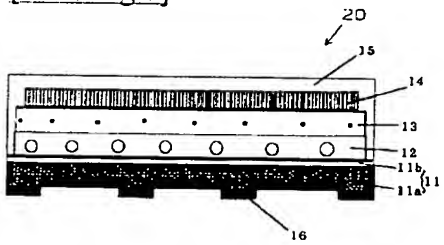


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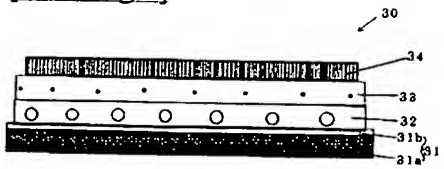
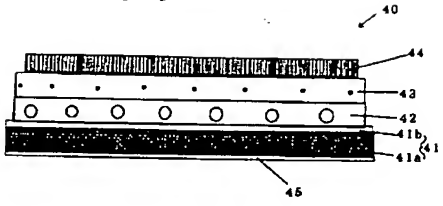



[Drawing 9]

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